REMARKS

Entry of this amendment and reconsideration of this application, as amended, are respectfully requested.

Claims 8-10 and 13 were rejected under 35 U.S.C. §103(a) over the combination of Hansen and Clifford. Claims 11-12 were rejected under 35 U.S.C. §103(a) over Hansen, Clifford and Bittner. Claim 14 was rejected under 35 U.S.C. §103(a) over Hansen, Clifford and Oei. Claims 15 and 1 were rejected under 35 U.S.C. §103(a) over Hansen, Clifford and Shaw. Applicants respectfully traverse.

Advantages of the presently claimed invention include, generally, improved process time and improved gassing properties. Treatment time for a part to be coated is only about half of the time if nitroguanidine is added. Typically, e.g., 18 min – 12 min of pickling time and 6 min of coating time were required. With nitroguanididne about 9 min – 6 min picking time and 3 min coating time are required. The pickling process is conducted with an acidic solution: If there is a beginning coating the pickling and gassing effect (generation of H and H_2) can destroy the coating again. During the strong pickling in the pickling time, the hydrogen gas is going out which is well seen by gas bubbling (gassing time). Only after the pickling period, when the solution is not as acidic, is the phosphate coating is developed. Since there is a decreased time and volume of hydrogen gas with the method of the present invention, the risk of making steel more brittle with hydrogen gas (gassing) is lowered too.

The combination of Clifford and Hansen does not provide any hint or suggestion that nitroguinidine allows the control of the content of Fe^{2+} in the bath solution which is very important because of sludge formation with Fe^{3+} and phosphate as well as the control of the roughness of the phosphate coating. A need to gain corrosion protection is mentioned in the cited reference but the phosphate coating of the present invention is primarily needed for a sliding friction processing of the metallic article. Therefore, the coating should be thicker than normal for uses with corrosion protection and paint adhesion, and the surface roughness of the coating is decisive for its abrasiveness. Therefore, there protection must be provided so that e.g.,

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a metallic tool does not weld together with the metallic part during the sliding friction application by various forces. Also, the phosphate layer must to be a very fine crystalline layer to avoid friction.

The Examiner, in the Response to Amendment, refers to "not sufficient anti-corrosive properties", but there is only a limited need for these. Therefore, there are other properties, including less abrasiveness and a higher coating thickness that are more important, perhaps the Examiner has not fully considered the Declaration of Mr. Nittel and is respectfully invited to review it.

With respect to the cited references, Clifford concerns corrosion protection and paint adhesion (very beginning of col. 1), but does not teach or suggest anything about sliding friction or abrasiveness. Clifford discloses that accelerators like nitroguanidine are so effective that phosphate coatings can be produced in the cold. Typically, there is a significantly worsening of behaviors at low or cold temperatures. Also, there is no information of the coating thickness and the coating quality, but for such an early state of the art of phosphating of 1939, and the quality requirements were significantly different and there is no indication that anybody thought at that early time to use a manganese phosphate coating for sliding friction and how this coating would have to be optimized.

Hansen does not mention how to limit the Fe^{2+} content in a phosphating bath used with a lot of steel surfaces and the chemical system of Hansen would not limit the Fe^{2+} in the phosphating bath. Therefore, the limits according to the present application of 0.2 to 4 g/L Fe^{2+} will be soon surpassed soon when steel surfaces are coated. The final bath of it may show about 5 to 9 g/L of Fe^{2+}, which is quite too much, as there will not be an adequate formation of the phosphate coating: Typically the crystals will be too coarse and the coating will be inhomogeneous and often insufficiently closed. Where a coating is insufficiently closed, corrosion easily occurs. In col. 2, line 11, there is described of a range of Fe^{2+} of 0 to 30 g/L, and all the chemical components are to be found there in extremely broad ranges. The strong chemical reaction indicates a high consumption of chemical compounds.

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In col. 2, l. 57-61, it is disclosed that strong oxidizing agents such as chlorates, peroxides, bromates and nitrites may limit the Fe^{2+} content, but in the present application it is only optionally intended to add air or $KMnO_4$, but in such way that the content of Fe^{2+} is still at least 0.2g/L. Therefore, it is shown in the paragraph bridging pages 4 and 5 that nitrate will produce autocatalytically nitrite, which is counterproductive, without any addition of nitroguanidine.

Hansen also does not disclose nitroguanidine as this compound is neither an oxidizing agent, nor a typical accelerator for phosphating processes.

Hansen (col. 2, l.40-42) proposes to add polyphosphoric acid or polyphosphate, but such components are so called "bath poisons" in phosphatings as already low contents of it may lead to thinner or even not totally closed phosphate coatings which are less anti-corrosive.

The present application, as mentioned in the paragraph bridging pages 2/3, is directed in part to minimizing the roughness of the coating, which is strongly correlated with the crystal sizes, while nevertheless generating coatings of medium to high thickness. Normally, the expert in the art would expect that thicker coatings would have much bigger crystals as there is a longer coating time and therefore the crystals would have more time to crystallize.

For the object of the present application it is important to control the Fe^{2+} content. There has to be a certain minimum content (e.g. 0.2 g/L) to obtain the desired properties.

Manganese phosphating solutions typically lead by the coating of steel surfaces to coatings of crystalline monoklin hureaulith $(Mn, Fe)_5H_2(PO_4)_4.4H_20$, whereas zinc phosphate solutions—even with a minor manganese content—lead to crystalline monoklin phosphophyllite, $Zn_2(Mn,Fe)(PO_4)_24H_2O$, together with or alone of crystalline orthorhombic hopeite, $Zn_3(PO_4)_2.4H_20$. The different formulas indicate significantly different chemical reactions (e.g. by dihydrogen phosphate), significantly different kinetics and significantly different chemical behavior of the coatings.

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Shaw describes a coating process for phosphating, oxalating, chromating or oxide coating whereby the bath e.g. for manganese phosphating is heated up and covered with a liquid hydrocarbon layer to generate a second layer of the hydrocarbon material on top of the phosphate layer e.g. by dipping parts and maintaining the parts in the middle of the bath. Nitroguanidine is mentioned in Example V which replaces nitrate in comparison to Example IV, but the function and the effect of nitroguanidine are not indicated. The expert in the art may learn to use it as a single accelerator for phosphating, but no more; and the content in the bath is about 1 g/L.

Shaw mentions a drawing process which is a coldforming, but does not mention—in contrast to the allegations of the Examiner—sliding friction. During coldforming there are typically two layers used, a very thick phosphate layer and one lubricating layer on top of it of a lubricant, e.g., a specific soap material. The phosphate layer protects the metallic part, e.g., which is to be drawn like a rod or wire, for very short time from corrosion and from direct contact to the metallic tool so as not to weld together and destroy the tool and the drawing machine. The lubricant enables the drawing with a minimum of forces, but this is no application of sliding friction with a long-tie durable fine-crystalline phosphate coating.

Oei describes a zinc phosphating process on the base of ZnMnNiFe phosphate for a drawing process (coldforming, example). Zinc is the predominant cation. Therefore, it would likely generate phosphophyllite and hopeite and not hureaulith. This would not be a typical manganese phosphating which works clearly different from typical zinc phosphating and generates other coating properties. One object is to propose a low temperature ZnFe phosphating process, but there is no teaching how a manganese phosphating bath could be handled so that there is steadily a Fe^{2+}. The S value is kept significantly lower (col. 3, lines 5/6) than for the presently claimed. The bath temperature is of 30 - 50°C (col. 1, line 55) which was used only for zinc phosphating until recently, but not for manganese phosphating. Furthermore, the activation – which is typical for zinc phosphating—is performed with titanium phosphate (col. 3, l. 43-46), but for manganese phosphating like in the example 1 of Hansen and in the present application, a manganese phosphate activation is used prior to manganese phosphating, which is a further typical difference between manganese phosphating and zinc phosphating. The phosphated

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workpieces may be posttreated with a soap or borax as lubricant and coldformed, but sliding friction is not mentioned. As thick coatings are needed, the cation content may be extremely high. The function and effect of tartaric acid as used in the example too is not indicated.

Therefore, Oei et al. teaches away from the presently claimed invention.

Bittner concerns coils and steel sheets which show on the one side steel surfaces and on the other side a metallic zinc coating. According to the main claim, the phosphate coating is only generated on the metallic zinc coating (in the presently claimed application steel is typically phosphated). Bittner describes a typical low zinc tri-cation process (ZnMnNi) as otherwise typically used e.g. in automobile industry for the coating of parts, but which should be adapted for use for specifically precoated coils and steel sheets. But ZnMnNi phosphatings are not well suited for use in sliding friction processes. It primarily concerns very high acid contents shifting the S value to very low values, as there has to be a very high pickling rate since there is only a very short time for the chemical process of pickling on a quickly moving coil. Bittner does not disclose the function and effect of the complexing agent like tartaric acid (col. 3 middle) as used in the example.

Clearly, a prima facie case of obviousness has not been established.

Furthermore, Applicants submit a signed Declaration of Ralf Schneider which is self-explanatory and supports the foregoing.

In view of the foregoing, allowance is respectfully requested.

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The Commissioner is hereby authorized to charge any deficiency in the fees filed to our Deposit Account No. 50-0624 under Order No. NY-CHEMMT-206.1-US.

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Respectfully submitted,

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